Orbigator Control Board – Electronics Specification (v1.4, Pinouts Updated)

This document updates the Orbigator v1.4 specification with the latest Raspberry Pi Pico 2 pin assignments for two ULN2003 stepper drivers, two Pololu-style STEP/DIR drivers, the OLED+RTC I²C bus, and the rotary encoder.

I²C Bus and User Interface

I²C0 Bus:

Signal	Function	Pico 2 GPIO
I2C0_SDA	OLED + RTC data	GP4
I2C0_SCL	OLED + RTC clock	GP5

Rotary Encoder:

Signal	Function	Pico 2 GPIO
ENC_A	Rotary encoder A	GP16
ENC_B	Rotary encoder B	GP17
ENC_PUSH	Encoder push button (active LOW)	GP18

ULN2003 Stepper Drivers (28BYJ-48 Motors)

ULN2003 #1 – AOV (Argument-of-Vehicle) 28BYJ-48:

Net	Function	Pico 2 GPIO
AOV_IN1	ULN2003 #1 IN1 (coil 1)	GP8
AOV_IN2	ULN2003 #1 IN2 (coil 2)	GP9
AOV_IN3	ULN2003 #1 IN3 (coil 3)	GP10
AOV_IN4	ULN2003 #1 IN4 (coil 4)	GP11

ULN2003 #2 – Spare 28BYJ-48 (optional):

Net	Function	Pico 2 GPIO
ULN2_IN1	ULN2003 #2 IN1 (coil 1)	GP19
ULN2_IN2	ULN2003 #2 IN2 (coil 2)	GP20
ULN2_IN3	ULN2003 #2 IN3 (coil 3)	GP21
ULN2_IN4	ULN2003 #2 IN4 (coil 4)	GP22

Pololu-Style STEP/DIR Drivers (Bipolar Steppers)

Pololu Driver #1 – LAN Stepper:

Net	Function	Pico 2 GPIO
LAN_STEP	Pololu #1 STEP (LAN / globe rotation)	GP14
LAN_DIR	Pololu #1 DIR	GP15
LAN_M0	Pololu #1 microstep pin M0	GP2
LAN_M1	Pololu #1 microstep pin M1	GP3
POLOLU_EN	Shared EN/SLEEP for all Pololu drivers	GP13

Pololu Driver #2 – Spare Bipolar Stepper:

Net	Function	Pico 2 GPIO
M2_STEP	Pololu #2 STEP (spare bipolar)	GP0
M2_DIR	Pololu #2 DIR	GP1
M2_M0	Pololu #2 microstep pin M0	GP6
M2_M1	Pololu #2 microstep pin M1	GP7
POLOLU_EN	Shared EN/SLEEP for all Pololu drivers	GP13

High-Level Block Diagram

Pico 2 GPIO assignments overview: +------------------------------+ | Pico 2 | | | | I2C0_SDA (GP4) ---- OLED + RTC (DS3231) | | I2C0_SCL (GP5) | | | | ENC_A (GP16) ---- Encoder A | | ENC_B (GP17) ---- Encoder B | | ENC_PUSH (GP18) ---- Encoder Switch | | | | AOV_IN1-4 (GP8-11) ---- ULN2003 #1 AOV | | ULN2_IN1-4 (GP19-22) ---- ULN2003 #2 | | | | LAN_STEP (GP14) ---- Pololu #1 STEP | | LAN_DIR (GP15) ---- Pololu #1 DIR | | LAN_M0/M1 (GP2,GP3) ---- Pololu #1 M0/M1| | M2_STEP (GP0) ---- Pololu #2 STEP | | M2_DIR (GP1) ---- Pololu #2 DIR | | M2_M0/M1 (GP6,GP7) ---- Pololu #2 M0/M1| | POLOLU_EN (GP13) ---- EN/SLEEP (shared) | +------------------------------+

Notes

- EN/SLEEP for all Pololu drivers is shared on GP13 to simplify control. - OLED and DS3231 RTC share the same I²C0 bus on GP4/GP5. - The rotary encoder (A/B/SW) uses GP16/17/18 as verified on the breadboard prototype. - ULN2003 #1 is reserved for the AOV (Argument-of-Vehicle) 28BYJ-48 stepper. - ULN2003 #2 and Pololu #2 are available for future expansion.